Poster Presentation

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Effects of bentonite on morphological properties of N-TiO2/bentonite photocatalysts

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TiO2 (anatase phase) is the most common semiconductor photocatalyst used in photocatalytic process because it is low cost, non-toxic, water insoluble and it has an advanced oxidation property [1]. Basically, during the process, electrons from the valence band (VB) of TiO2 are excited to the conduction band (CB) by light of higher energy than the respective band gap, resulting in the formation of e−/h+ pair. Electrons in the conduction band can reduce O2 to form superoxide radicals (O2•−) while reactions of valence band holes with surface adsorbed H2O or HO− result in the formation of hydroxyl radicals (HO•), hydrogen peroxide (H2O2), and protonated superoxide radicals (HOO•). Free electrons/holes, and reactive oxidizing species such as HO2•, HO• and O2•− react with the surface adsorbed impurities including inorganic, organic compounds, and biological species (bacteria, virus, etc.) leading to their decomposition. The efficiency of a photocatalytic reaction mainly depends on the capability of the photocatalyst to generate longer-lived electrons and holes that result in the formation of reactive free radicals. However, there are several limitations to use TiO2 nanoparticles in photocatalytic reactors due to the recombination of photo-generated charge carriers, the photo-excited electrons return back to the valence band, which decreases the photocatalysis efficiency. Moreover, as TiO2 has a large band gap (3.2eV), it can only be stimulated by UV light which is a small fraction (<5%) of solar spectrum. Many methods including doping with ions and heterojunction formation have been demonstrated to reduce photo-excited charge carrier recombination. Among them, The Nitrogen doped TiO2 (N-TiO2) was found to be more efficient due to the less formation of recombination centres and it capability to narrow the band gaps and makes the TiO2 catalyst access visible light as an energy source [2]. Other shortcoming is the difficult recovery of TiO2 nanoparticles from treated water. Then, attempts have been made to immobilize TiO2 on different supports such as minerals clay which received wide attention due to their adsorption capacity, low cost and large specific area [3]. The aim of this study is to develop new materials based on the bentonite modified with nitrogen-doped TiO2 (N-TiO2/bentonite) suitable for photocatalysis application under visible light irradiation. A two steps sol-gel method was used to synthesize photocatalysts. The bentonite was first activated and then was used as template for N-TiO2 growth on the sheet. The results showed that, depending on how bentonite was activated (with organic surfactant or acid solution); the obtained photocatalysts have different morphological properties such as particle size, crystalline phase and specific surface area which strongly affect the efficiency of their photocatalytic activity. So, the understanding of this mechanism becomes important for the development of new and enhanced photocatalysts materials.

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